



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/767,483	01/28/2004	K. Ranji Vaidyanathan	003248.00093	5060
22908	7590	05/16/2006	EXAMINER	
BANNER & WITCOFF, LTD. TEN SOUTH WACKER DRIVE SUITE 3000 CHICAGO, IL 60606				AFZALI, SARANG
ART UNIT		PAPER NUMBER		
		3729		

DATE MAILED: 05/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>
	10/767,483	VAIDYANATHAN ET AL.
	<b>Examiner</b>	<b>Art Unit</b>
	Sarang Afzali	3729

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 27 February 2006.
- 2a) This action is FINAL.                            2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-14 and 27-31 is/are pending in the application.
  - 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-14 and 27-31 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 18 January 2005 is/are: a) accepted or b) objected to by the Examiner.
 

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All    b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | Paper No(s)/Mail Date. _____.   |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>10242005</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
|   | 6) <input type="checkbox"/> Other: _____.                                   |

**DETAILED ACTION**

***Response to Amendment***

1. The applicant's amendment filed on 2/27/2006 has been fully considered and made of record.

Claims 15-26 are cancelled.

***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-14 and 27-31 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1, line 2, the limitation “simultaneously extruding . . .” is considered new matter and not described in the specification nor explicitly supported in the drawings.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-2, 5-6, and 27-31 are rejected under 35 U.S.C. 102(e) as being anticipated by Musso et al. (US 2003/0173720).

As applied to claim 1, Musso et al. teach a method for forming channeled articles used as heat sink for semiconductor devices wherein:

- (a) simultaneously extruding forming one or more filaments including first composition (cores 36 & 38, Fig. 5) enclosed in a second composition body (14, Fig. 5);
- (b) mechanically processing the filaments (36, 38, Fig. 5) to arrange them in a predetermined orientation to provide a green body (intermediate part 40, Fig. 5);
- (c) subjecting the green body to conditions effective for removing the first composition (cores 36 & 38) from intermediate body (40) and sintering the second composition (body 14, para. [0041], lines 1-7) to provide a heat exchanger wherein channels (12, Fig. 1) having walls made of the sintered second composition for

containing coolant flow with the channels having inner diameters of no more than about 2000 microns (para. [0110], lines 1-2, channels inner diameters of 0.013 inch is equivalent to 330 microns).

As applied to claim 2, Musso et al. further teach that filaments (core members) are mechanically processed by extruding them and depositing the filaments onto a working surface of in one or more layers (para. [0209], lines 1-3).

As applied to claim 5, Musso et al. teach that the first composition (core members) are thermally degradable composition and wherein the first composition is removed from the green body by heating it (para. [0219], lines 1-3).

As applied to claim 6, Musso et al. teach that the second composition (body 14) is metal and sinterable ceramics (para. [0090], lines 1-3 and Table 2).

As applied to claims 27 and 28, Musso et al. teach that the channels have inner diameters of between about 50 microns to about 100 microns. Note that Musso et al. teaches channels inner diameters of 0.013 inch, which is equivalent to 330 microns (para. [0110], lines 1-2) and channels inner diameters of as small as 0.0001 inch, which is equivalent to 2.54 Microns (para. [0199], lines 11-12).

As applied to claims 29-30, Musso et al. teach that the channels (12, Fig. 1) are arranged in the same direction and further filaments are arranged in two layers and at least two adjacent layers are arranged with the filament positioned to 90° to one another to provide a heat exchanger having multi-directional channels (Fig. 1, para. [0036], lines

8-11, channels 16 are all parallel to each other and channels 18 are all parallel to each other and at 90° or perpendicular to the channels 16).

As applied to claim 31, Musso et al. teach the channels 16 and 18 are circular in cross section and therefore curved (Fig. 1).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Musso et al. in view of Hoopman et al. (US 5,317,805). Musso et al. teach the invention cited with the exception of exclusively disclosing the limitations of using a solvent to remove first composition. However, it is well known in the art to provide different methods for removing a core used to form a cavity in a ceramic matrix composite where the core is removed by heating, leaching and solvents amongst other methods. Furthermore, Hoopman et al. teach a method of making microchannel heat exchangers utilizing sacrificial cores wherein a core in a unitary microchannel heat exchanger's shell is made around a sacrificial core (102) with microchannel forming portions (108) that comprise filaments and further these filaments are removed by being dissolved in a solvent (col. 18, lines 13-18) resulting in fabrication of complex geometries of heat

exchanger design to effectively meet the cooling demands of almost any shaped component or other medium requiring a specific heat exchanger geometry (col. 4, lines 28-33). It would have been obvious to one ordinary skill in the art at the time of invention to have provided Musso et al. with a suitable core composition such as one taught by Hoopman et al. in order to provide an effective and suitable means of fabrication for complex geometries of heat exchanger design.

8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Musso et al. in view of and Hoopman et al. as applied to claim 3 and further in view of Davenport (US 3,222,144). Musso et al. modified by Hoopman et al. teach the invention cited with the exception of exclusively disclosing that the solvent used is water. It is well known in the art that the solvent used would depend on the chemical characteristics of the chemical targeted for removal, hence a water solvent is only indicative of the type of core material being used. Furthermore, Davenport teaches a manufacturing method of grid or honeycomb structures intended for use as heat exchangers (col. 6, lines 57-58) wherein a core (16) made of water soluble material can be dissolved in order to provide a self-supporting honeycomb structure within a shell or casing in a product in which the cellular passages are to be open (col. 4, lines 30-38, 45-48). It would have been obvious to one ordinary skill in the art at the time of invention to have further provided Musso et al./Hoopman with a suitable solvent such as one taught by Davenport in order to provide an effective and suitable means of removing the core material resulting in fabrication of self-supporting honeycomb structure within a shell.

9. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Musso et al. in view of Hanaki et al. (US 4,746,479). Musso et al. teach the invention cited with the exception of exclusively disclosing the limitation of silicon carbide. However, Hanaki et al. disclose a method of manufacturing a heat exchange element wherein the green body has a composition of silicon carbide used to form block type heat exchange elements which are heat resistive and have an improved property against thermal shock (col. 10, lines 32-38). It would have been obvious to one ordinary skill in the art at the time of invention to have provided Musso et al. with a suitable material such as one taught by Hanaki et al. in order to provide an effective and suitable material for a heat exchange element.

10. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Musso et al. in view of Avakian (US 2004/0106713).

As applied to claims 8-10, Musso et al. teach the invention cited with the exception of exclusively disclosing the use of a thermal conductivity enhancing material (claim 8), type of additive (claim 9) and weight percent (claim 10). However, Avakian teaches the use of additives in a thermoplastic compound wherein nanotubes of carbon is used as an example of thermal conductivity additive with a preferred range of 2 to 95 weight percent in order to enhance the existing manufacturing and use performance of the compound (Abstract, lines 1-12). It would have been obvious to one ordinary skill in the art at the time of invention to have modified Musso et al. with a suitable type and

amount of additive material such as ones taught by Avakian to provide an effective means of further increasing the thermal conductivity of the heat exchange element.

11. Claims 8 and 9 are alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Musso et al. in view of Ocher et al. (US 2003/0131476). Musso et al. teach the invention cited with the exception of exclusively disclosing the use of a thermal conductivity enhancing material (claim 8) and type of additive (claim 9) used. However, Ocher et al. disclose a heat-dissipating element wherein certain materials are adequately used in making radiator structures (101, Fig. 17), heat conduits (115, Fig. 17) and heat reservoir (125, Fig. 17) for their high thermal conductivity characteristics such as silicon carbide (para. [0077], lines 1-10). It would have been obvious to one ordinary skill in the art at the time of invention to have modified Musso et al. with a suitable material such as one taught by Ocher et al. to provide an effective means of further increasing the thermal conductivity of the heat exchange element (col. 10, lines 43-51).

12. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Musso et al. in view of Rainer et al. (US 5,533,258). Musso et al. teach the invention cited with the exception of exclusively disclosing the limitations of depositing a thin layer of material (claim 11) and CVD process (claim 12). However, Rainer et al. teach a process for the manufacturing a cooling unit wherein a coating of an intermediate thin layer with a thickness range of 10 to 50  $\mu\text{m}$  is deposited by CVD

(chemical vapor deposition) process is used to provide an excellent joint between the parts made of heat resistant material and the metallic coolant conduit (col. 2, lines 25-30). It would have been obvious to one ordinary skill in the art at the time of invention to have provided Musso et al. with deposition of a thin layer of material such as one taught by Rainer et al. to provide an effective means of part connection that would be capable of withstanding the high thermal stresses occurring during operation without the development of any significant damaging material cracks (col. 1, lines 60-67).

13. Claims 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Musso et al. in view of Rossi (US 2002/0037142). Musso et al. teach the invention cited with the exception of exclusively disclosing depositing a metallic layer. However, Rossi teaches a high thermal conductivity structure with a heat sink wherein the outer surface of the heat sink (18, Fig. 4) is nickel plated to provide improve weldability (para. [0060], lines 7-9). It would have been obvious to one ordinary skill in the art at the time of invention to have modified Musso et al. with a suitable metallic layer such as one taught by Rossi to provide an effective means of improved welding.

14. Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Musso et al. in view of McCullough (US 6,093,961). Musso et al. teach the invention cited with the exception of exclusively disclosing the external protrusions. However, McCullough teaches a molded heat sink assembly wherein external protrusions (heat dissipating members (18), Fig. 2) is integrally formed to the base member (12, Fig. 2) and pointing

upwardly into the air for optimum heat exchange from the base member (12, col. 4, lines 28-30). It would have been obvious to one ordinary skill in the art at the time of invention to have modified Musso et al. by forming suitable external protrusions such as ones taught by McCullough to provide an effective heat dissipating means.

### ***Response to Arguments***

15. Applicant's arguments filed on 2/27/2006 have been fully considered but they are not persuasive.

16. Applicant's arguments, see "Remarks", page 1, paragraph (5), with respect to the rejection of claim 9 under 35 USC 112 2<sup>nd</sup> paragraph have been fully considered and are persuasive. The rejection of claim 9 under 35 USC 112 2<sup>nd</sup> paragraph has been withdrawn.

17. As for claims 1-2 and 5-6 and in particular independent claim 1 rejected under 35 USC 102(e) as anticipated by Musso et al. in an office action mailed on 10/26/2005, Applicant argues in "Remarks", pages 2 and 3 and specifically page 2, paragraph (3), lines (11-14), that Musso et al. fail to disclose extruded filaments that include a first composition encased within a second composition, where the finished article is formed from the second composition and the first composition is removed to provide channels within the finished article as claimed in claim 1.

The Examiner respectfully disagrees with the above arguments.

Note that Musso et al. teach that several suitable techniques can be used for forming the body portion including a liquid state (para. [0060], lines 1-8) and further

teach that extrusion is one of several liquid state methods that is used in forming the body portion (para. [0061], line 3). Musso et al. further teach that an extrudable composition is used as a core composition (para. [0209], lines 1-3). The Examiner considers that using an extrudable core and placing it in a die and extruding a body composition around it, as taught by Musso et al. clearly teaches the limitation of simultaneous extruding the core and body composition.

The Examiner considers a “non-simultaneous extruding” teaching to be if the core composition and body composition were separately extruded and then assembled together.

Furthermore, The Applicant has amended claim 1 by adding a new matter of “simultaneous extruding” even though the flow diagram shown on Fig. 4 and page (13), paragraph [46], lines 1-3) of the Applicant’s specification, clearly teach that core (24) and shell (26) are formed prior to being extrude together at step (30, Fig. 4) and therefore, further affirming the Examiner’s position as far as the definition of newly added “simultaneous extruding” limitation is concerned.

18. As for dependent claims 3, 4 and 7-14 rejected under 35 USC 103(a) as being anticipated over Musso et al. in view of several secondary references, in an office action mailed on 10/26/2005, Applicant further argues in “Remarks”, pages 2 and 3 and specifically page 2, paragraph (2), lines (1-2) that Musso et al. fail to disclose, teach or suggest a method for manufacturing a heat exchanger from one or more extruded filaments that include a first composition encased in a second composition, where the

first composition is subsequently removed and the second composition forms the heat exchanger, as presently claimed and therefore, None of Hoopman et al., Davenport, Hanaki et al., Avakian, Ocher et al., Rainer et al., Rossi, and McCullough suggest the method of manufacture as claimed and do not provide any teachings to cure the deficiencies of Musso et al.

The Examiner believes that Musso et al. still teach the presently claimed limitations of the amended claim 1 and therefore Musso et al. in combination with Hoopman et al., Davenport, Hanaki et al., Avakian, Ocher et al., Rainer et al., Rossi, and McCullough teach all limitations of claims 3, 4 and 7-14.

### ***Conclusion***

19. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

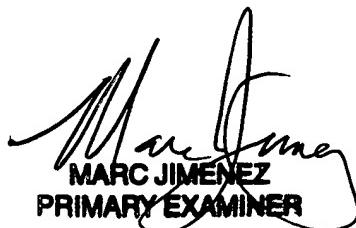
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sarang Afzali whose telephone number is 571-272-8412. The examiner can normally be reached on 7:00-3:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Vo can be reached on 571-272-4690. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S.A.

SA  
5/09/2006

  
MARC JIMENEZ  
PRIMARY EXAMINER

5-11-06